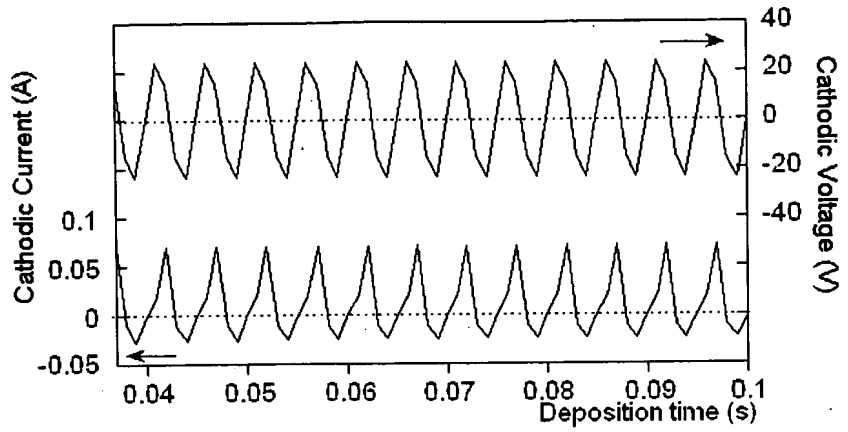
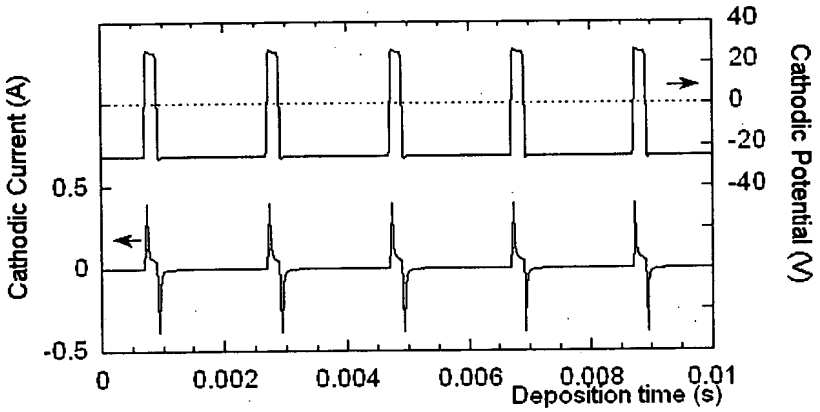


(a)



(b)

Fig. 1. Two examples of voltage waveforms and resulting current transients employed in the electrodeposition of Co arrays. (a) Sinusoidal AC waveform, (b) Asymmetric rectangular waveform.

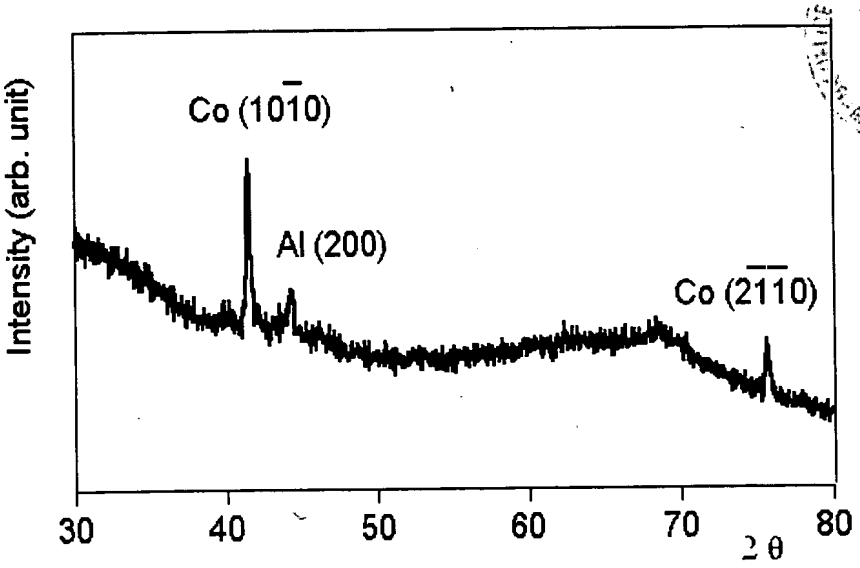


Fig. 2. XRD diffractogram of the Co-filled alumite film. A sinusoidal waveform was used for electrodeposition. Particle length = 1 μm, particle diameter = 25 nm.

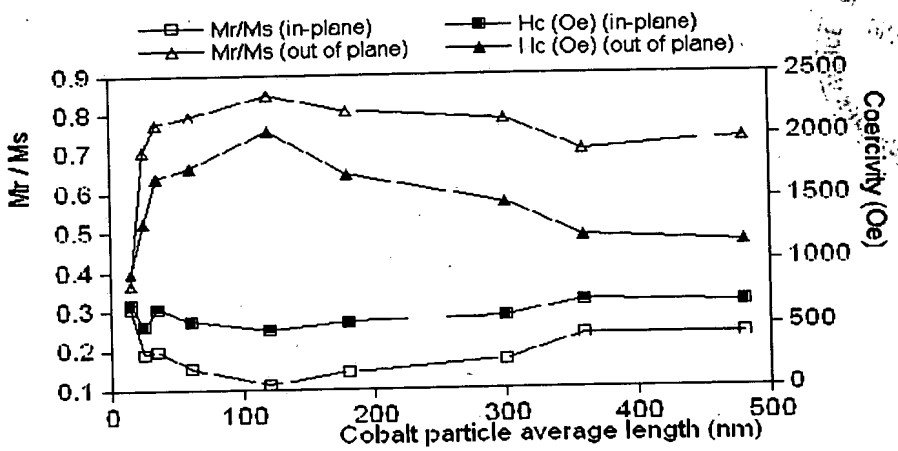


Fig. 3. In-plane and perpendicular squareness $S = M_r / M_S$ and coercivity vs. nanowire length l for Co arrays grown using a sinusoidal waveform.

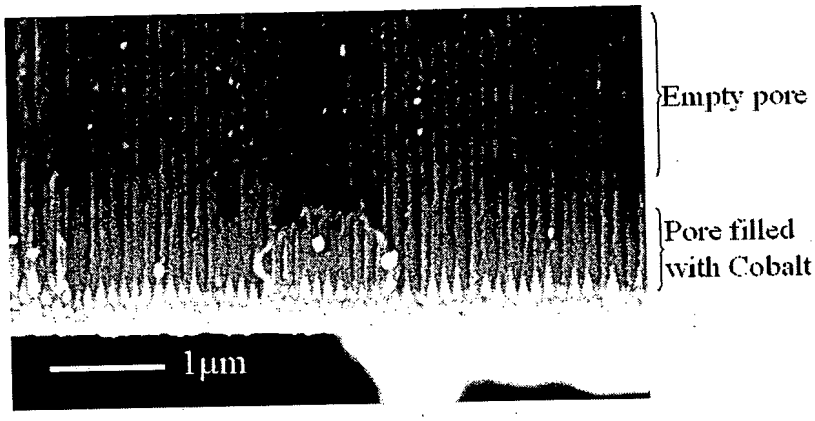


Fig. 4. Cross-sectional SEM image of a Co-filled alumite sample grown using a sinusoidal waveform. Co nanowires are bright in the figure. Mean nanowire length l = 1.2 m, diameter = 25 nm.

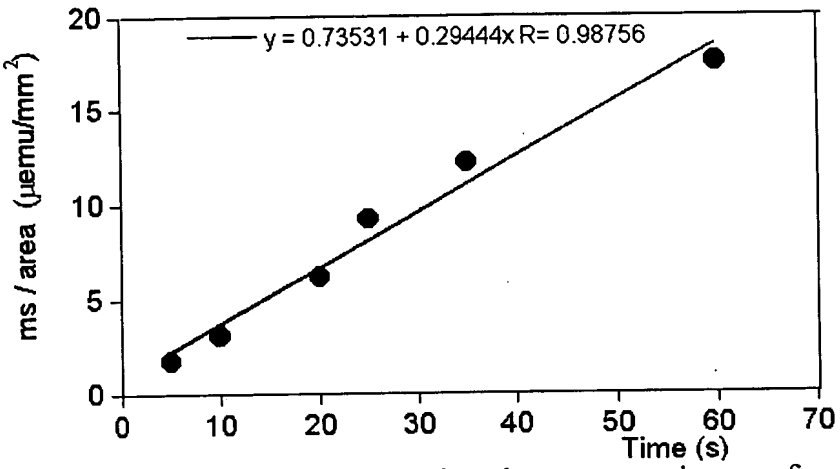


Fig. 5. Electrodeposition rate when using the asymmetric waveform of Fig. 1b. (saturation magnetization m_S per unit area, as a function of electrodeposition time t).

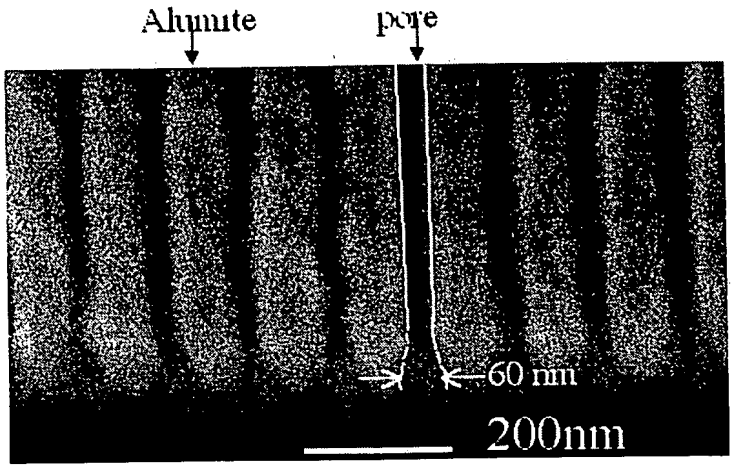


Fig. 6. SEM Cross-section of alumite pores (no Co in the pores) after anodization in phosphoric acid – the pore widening to d = 60 nm diameter is highlighted in the center.

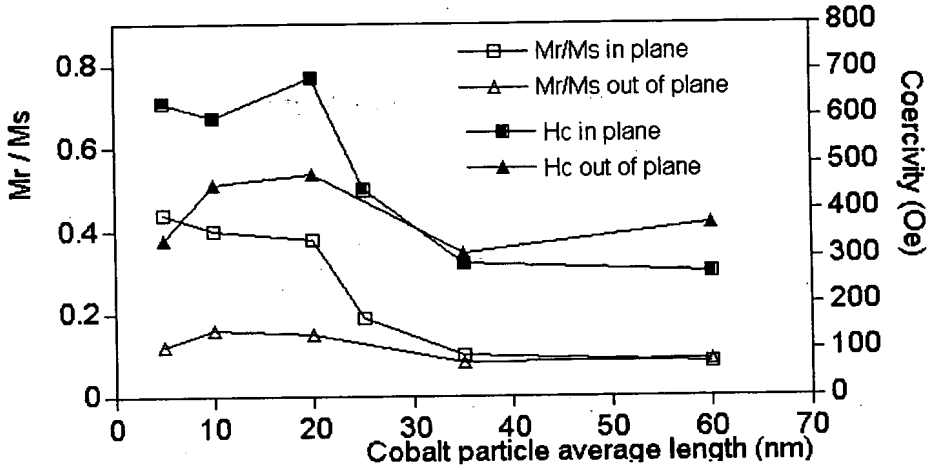
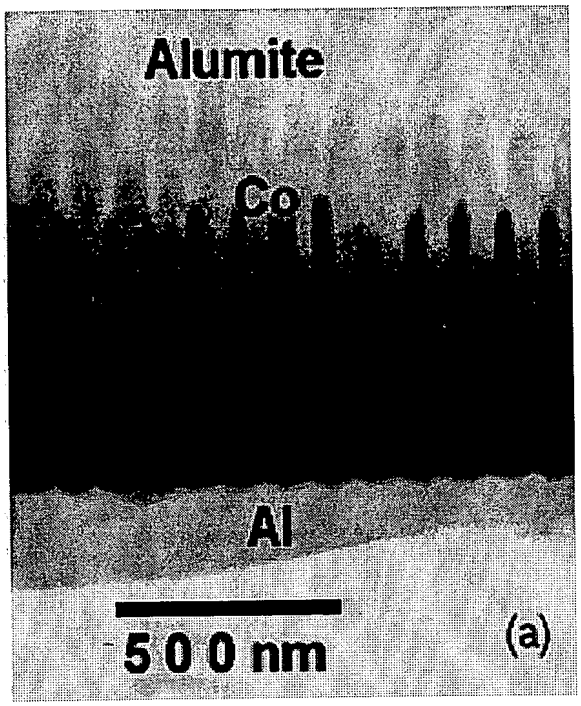


Fig. 7. In-plane and out-of-plane coercivity H_C and squareness M_r / M_S vs. average nanoparticle length l: a transition is seen for l < 20 nm.



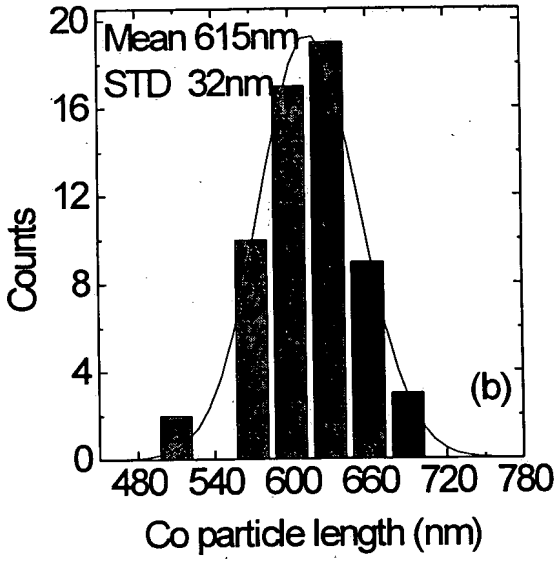


FIG. 8 (a) TEM cross-sectional view of Co arrays in alumite with average length 615 nm. (b) Length distribution determined over 60 particles.

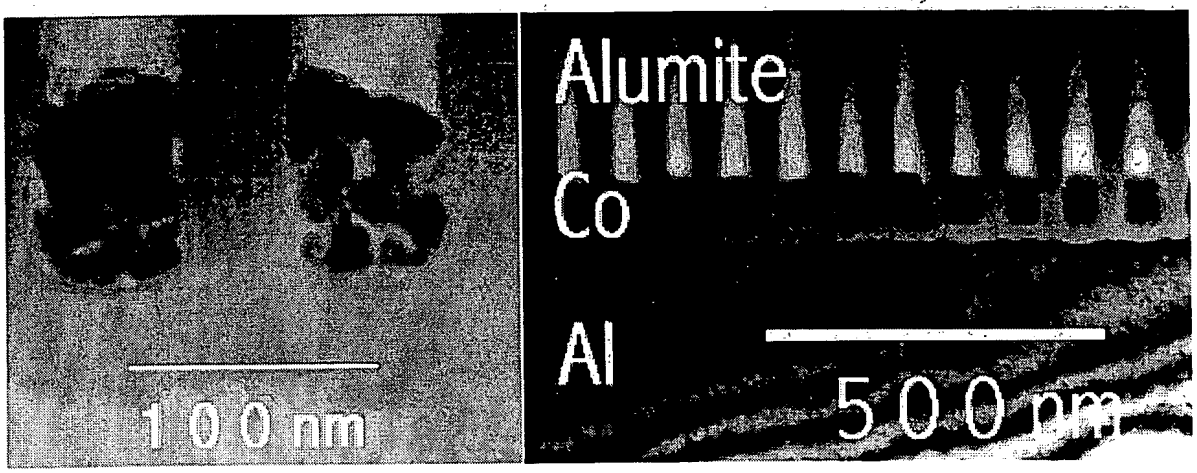


FIG. 9 TEM cross section of Co particles in ordered alumite. Left: details of the microstructure. Right: overview, showing the thickness uniformity.

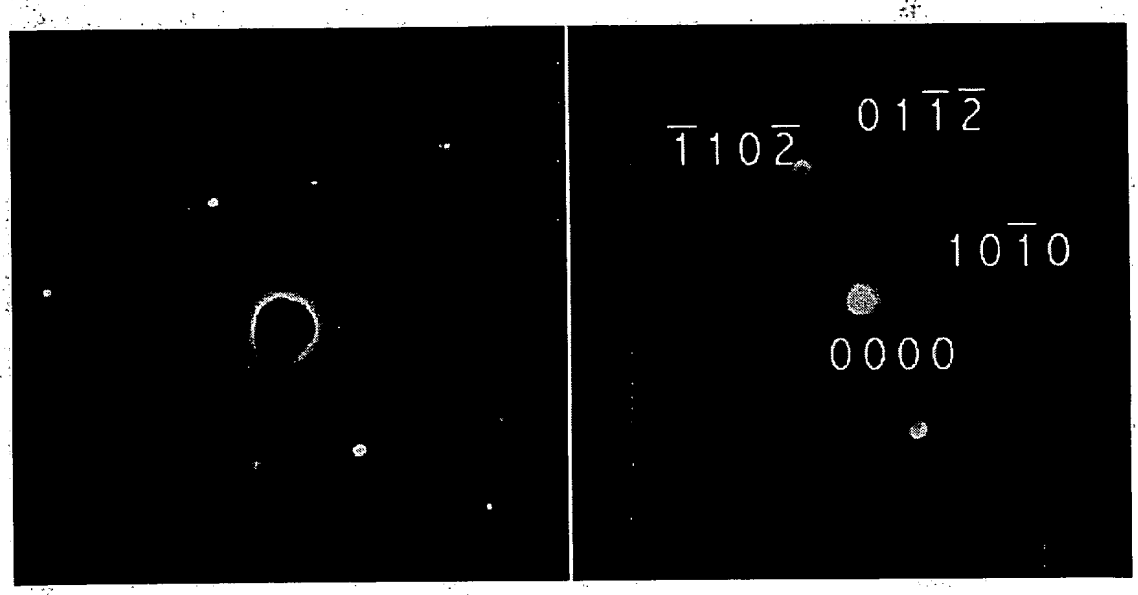


FIG. 10 TEM selected area diffraction patterns of (left) several grains of one Co particle, showing HCP ring patterns superposed to Al (112), and (right) the Co HCP (2423) diffraction pattern corresponding to one large grain.

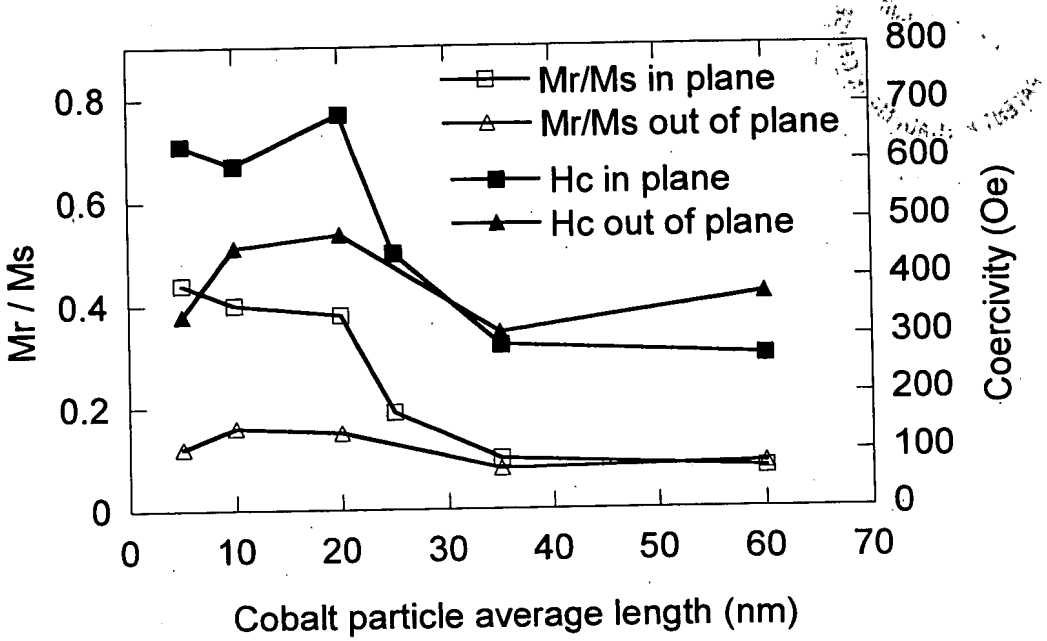


FIG. 11 Coercivity and Squareness vs. particle length of short Co particle arrays.

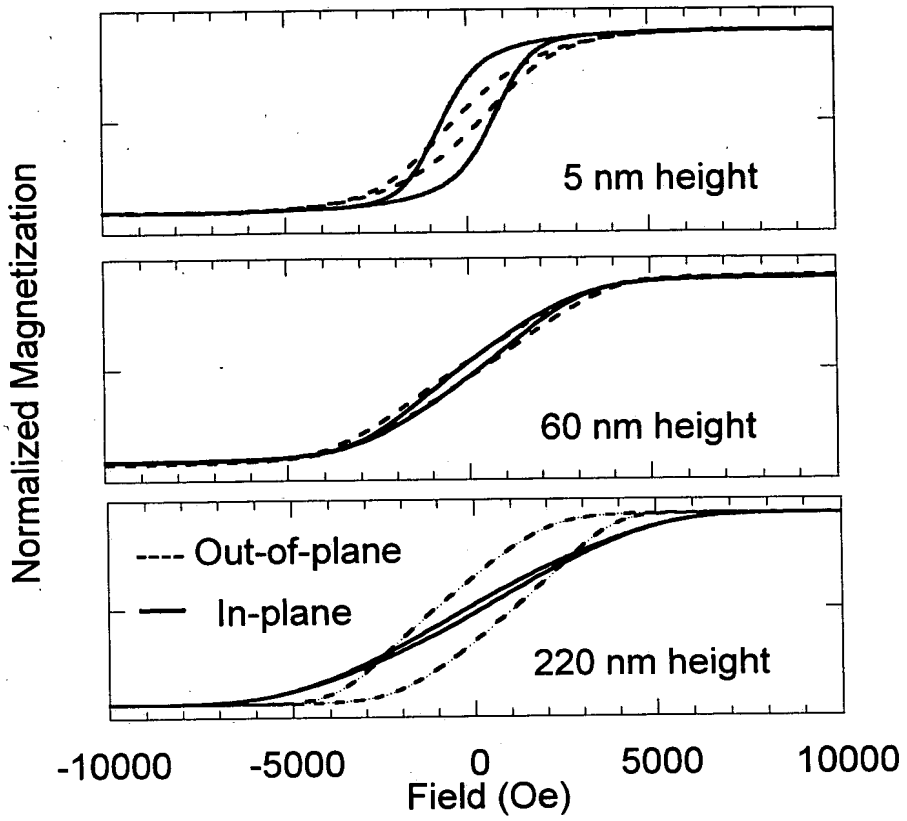


FIG. 12 Hysteresis loops of Co particle arrays with different thickness.

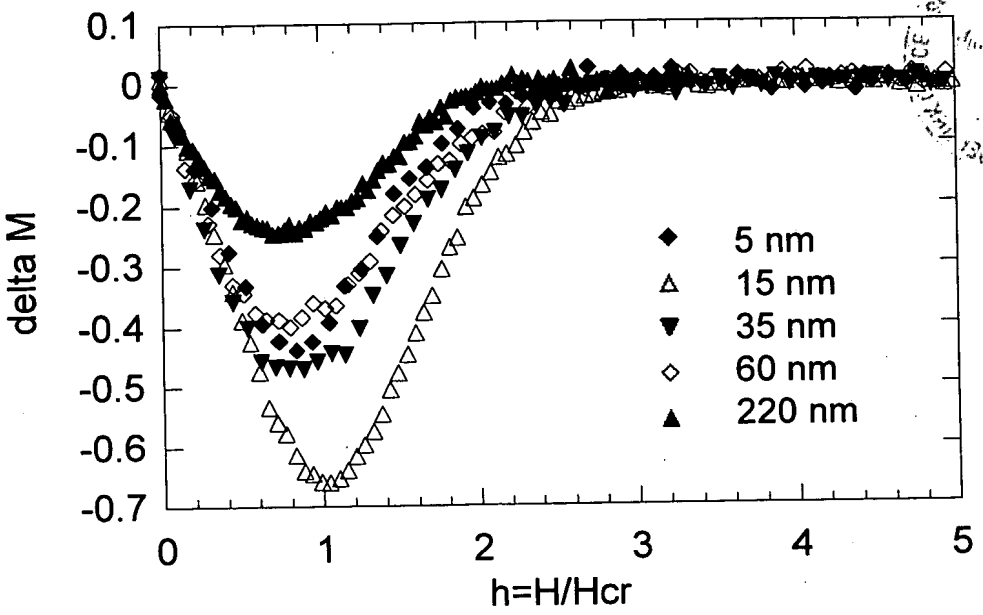


FIG. 13 ΔM curves vs. reduced applied field H/Hcr for various Co particle lengths.

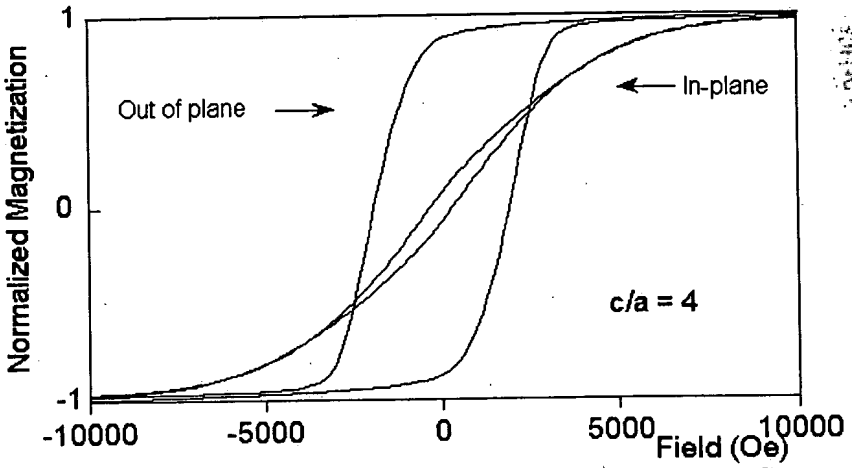


Fig. 14 In-plane and out-of-plane hysteresis loops of l = 100 nm Co nanoparticles, pore diameter d = 25 nm [6], ratio c/a = 4. A sinusoidal waveform (Fig. 1a) was used for electrodeposition.

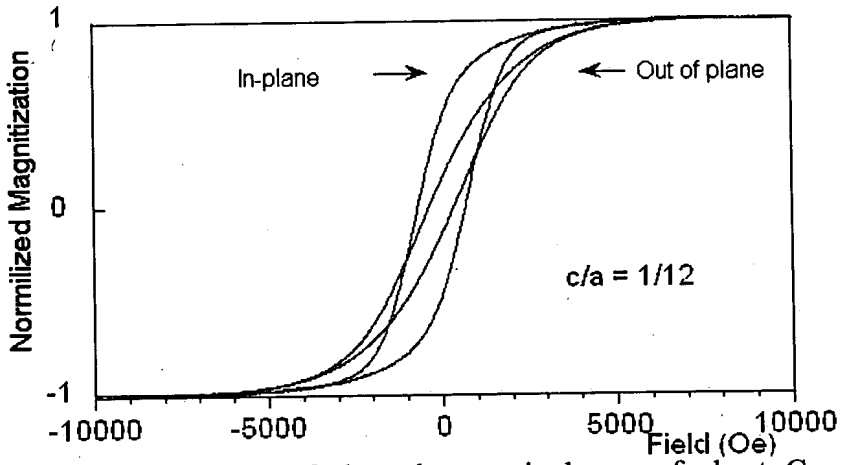


Fig. 15 In-plane and out-of-plane hysteresis loops of short Co nanoparticles obtained with an asymmetric rectangular waveform – length l = 5 nm, pore diameter d = 60 nm, ratio c/a = 1/12.